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McGuireWoods LLP
Suite 1800
1750 Tysons Boulevard
Tysons Corner
McLean, VA 22102-4215

EXAMINER

DOLAN, JENNIFER M

ART UNIT PAPER NUMBER

2813

DATE MAILED: 08/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/635,484

Applicant(s)

WERNER ET AL.

Examiner

Jennifer M. Dolan

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SW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-7 and 9-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5, 6, 9-15, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Publication 08-222371 to Shimo et al.

Regarding claims 1, 9-12, and 20 Shimo discloses a method and apparatus for structuring a homogeneous electrode for an organic light emitting display (paragraph 0001), the method and apparatus comprising: a laser light source (paragraphs 0016-0019; figures 3a-3c) and an optical unit (paragraph 0019; beam homogenizer and widener; also see figure 3b) such that the laser beam is expanded and widened to cover each target portion of each electrode to be ablated to form periodic structures (figure 3b); and a step of ablating the target portions of the electrode using the expanded beam (paragraph 0023-0025). Shimo further teaches that the pulse duration is desirably as small as possible, and preferably less than 100 ns (bottom of paragraph 0018), which generally includes a value of 20 ns.

Shimo fails to specifically indicate a pulse width of 20 ns or less.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the pulse width of the pulsed laser in Shimo is 20 ns or less. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide a very narrow pulse width, because Shimo shows that the pulse width is preferably less

than 100 ns (see bottom of paragraph 0018) and should be shortened to minimize thermal breakage of the anode and organic layers, while maintaining the ability to effectively pattern and ablate the electrode material (see paragraph 0018). A person having ordinary skill in the art would be expected, based on the preferred 'less than 100 ns' range taught by Shimo, to optimize the pulse width or other standard laser ablation conditions in order to achieve effective laser ablation of the electrode material. Although Shimo fails to specifically disclose a pulse width of 20 ns or less, it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

Regarding claim 2, Shimo discloses that the periodic structures are linear structures (figure 3b).

Regarding claims 3 and 19, Shimo discloses that the electrode is a cathode (paragraph 0018).

Regarding claims 5 and 6, Shimo discloses that the laser beam is a pulsed KrF excimer laser (paragraph 0023), which inherently emits at 248 nm.

Regarding claims 13 and 14, Shimo discloses using an optical unit having a mask (paragraph 0020), which inherently has a plurality of gaps.

Regarding claim 15, Shimo discloses that the optical unit has a beam homogenizer, a gap, and at least one cylindrical lens (paragraphs 0023; 0020).

Regarding claims 21 and 22, Shimo discloses that generally a power density of hundreds of mJ/cm² or higher would be necessary for ablating a metal material (see paragraph 0014).

Shimo further indicates that high power densities are problematic in that they increase thermal

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effects, but that the thermal effects may be compensated by using smaller pulse widths (see paragraph 0018).

Shimo fails to specifically suggest a power density of 500 mJ/cm².

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the ablation method of Shimo, such that the power density is 500 mJ/cm². The rationale is as follows: A person having ordinary skill in the art would have been motivated to use a power density of 500 mJ/cm², because Shimo teaches that large power densities are required for efficient ablation of metal materials (see paragraph 0014), and that the applied power density and pulse width are selected based on the material to be ablated, such that the ablation is accomplished with minimal thermal breakage (see paragraph 0018). Since Shimo teaches the general conditions of using a power density of hundreds of mJ/cm² and a pulse width of less than 100ns (see paragraphs 0014, 0018), it would be expected for a person having ordinary skill in the art to select appropriate, optimized values for the power density and pulse width, such that the material is effectively ablated with minimal thermal effects. Although Shimo does not specifically teach a power density of 500 mJ/cm², it has been held that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shimo et al. in view of U.S. Patent No. 6,719,916 to Dubowski et al.

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Shimo fails to disclose coating the homogeneous electrode with a material for facilitating absorption of the laser beam.

Dubowski discloses that the electrode is coated with a material for facilitating absorption of the laser beam prior to the ablation (column 4, line 60 – column 5, line 13; column 5, lines 50-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Shimo, such that a material for facilitating absorption is coated on the electrode, as suggested by Dubowski. The rationale is as follows: A person having ordinary skill in the art would have been motivated to use a coating material, because Dubowski shows that doing so reduces the required incident power density of the laser for ablating the metal electrode, which decreases or eliminates thermal ablation damage to the underlying organic layers (see Dubowski, column 4, line 60-column 5, line 13; column 5, lines 50-67).

4. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimo et al. in view of U.S. Patent No. 6,576,867 to Lu et al.

Shimo discloses that the laser ablation of the metal and organic layers generates debris. Shimo further teaches that the debris is removed from the system by blowing an inert gas stream into the processing region, such that the debris is prevented from redepositing on the device (paragraphs 0021-0022).

Shimo fails to disclose the specific structure by which the debris is removed from the system.

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Lu discloses a laser ablation system wherein debris is removed by a system substantially similar to that of Shimo, including an exhaust unit having an outlet vent (column 4, lines 42-48; 'exhaust inlet' 52 acts as an outlet vent, since it extracts fumes and debris generated by the ablation from the device region).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the apparatus of Shimo includes the exhaust unit and outlet taught by Lu. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide an exhaust unit with an outlet vent in the apparatus of Shimo, because Shimo teaches that the debris and residues generated by ablation must be removed from the device area by use of an air blower, but does not provide a complete structure whereby this is accomplished. Since Lu teaches an ablation apparatus including an air blower to remove debris and fumes from the device area, and since Lu further provides an apparatus structure including an exhaust unit and outlet by which the debris extraction is possible (Lu, column 4, lines 42-48), it is well within the purview of a person skilled in the art to combine the apparatus of Shimo with any ablation apparatus teaching the specifics of debris removal, such as that taught by Lu, in order to accomplish the debris-removal in Shimo (also see Shimo, paragraphs 0021-0022).

Allowable Subject Matter

5. Claim 8 is allowed.

6. The following is a statement of reasons for the indication of allowable subject matter:

The primary reason for allowability is that the prior art fails to suggest coating an electrode with

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graphite for facilitating absorption of the laser beam prior to ablation. The prior art either suggests a direct ablation of the metal electrode layer (see Shimo et al, for example), or use of alternate materials, such as silver (see Dubowski et al.) for promoting antireflection or absorption of the laser beam. Although it is further known in the art that graphite is absorptive of ultraviolet light, there is no suggestion in the prior art that such a layer is usable for coating a metal electrode layer to promote ablation, nor is there any suggestion that graphite would be a compatible or viable material with an OLED structure, OLED manufacturing processes, or laser ablation of metal electrodes in general. Hence, it is the examiner's opinion that a person having ordinary skill in the art would have found no motivation to use graphite as a metal electrode coating layer in an OLED fabrication process.

Response to Arguments

7. Applicant's arguments filed 6/14/05 have been fully considered but they are not persuasive.

Regarding the validity of the 103 obviousness-type rejections based on Shimo:

The Applicant argues that Shimo teaches a pulse width range of from 100 microseconds or less to 100 ns or less and lacks sufficient motivation for reducing the pulse width to the claimed range. The Applicant further argues that Shimo cannot be modified to use a 20 ns pulse width, since the lower power taught in Shimo would not effectively ablate the electrode.

The Examiner disagrees with this characterization of Shimo. The pulse width disclosed by Shimo is 100 microseconds or less, or "more preferably 100 or less nanoseconds" (Shimo, paragraph 0018). Hence, the range disclosed by Shimo is considered to be 100 ns or less, which

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encompasses the claimed range of 20 ns or less. Since Shimo suggests in paragraph 0018 that decreasing the pulse width will alleviate issues with thermal breakage, and since Shimo broadly suggests a range of 100 ns or less, it is reasonable and well within the purview of a person having ordinary skill in the art to optimize the pulse width within the disclosed range of '100 ns or less'. Furthermore, since Shimo teaches the general condition of the usage of hundreds of mJ/cm² power density for ablation of metal materials (paragraph 0014), and that reduced pulse width can alleviate thermal effects from higher power densities, it would be reasonable for a person skilled in the art to optimize both the power density and pulse width to achieve the best ablation results. The Applicant is reminded that absent a showing of an unexpected result or criticality of the values, it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

Regarding the Applicant's assertion that 'an unexpected more efficient ablation of the electrode can be achieved' with the Applicant's disclosed process (see page 9 of the specification and first paragraph of page 8 of the arguments), the Examiner does not find this argument persuasive. The Applicant has merely shown that a power density of 500 mJ/cm² and a pulse width of 20 ns can effectively ablate an aluminum layer having a thickness of 250 nm, but offers no evidence that the specific values used are critical, and that an unexpected result is obtained by the usage of such values.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd



CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800